Research in Health & Medical Sciences *Original Article*

2022 June; 1(2)

Promoting the Physical Activity in Postmenopausal Women. Trans-Theoretical Model-based intervention

Gholamreza Masoudy[1], Ashraf Sadat Dehghani*[2], Hossein Ansari[3], Mohammad Hadi Abbasi[4], Hossein Bagheri[5], Javad Shahraki[6]

[1] Associate Professor, Health Promotion Research Center, Zahedan University of Medical Sciences, Zahedan, Iran.
[2] Master of Sciences in Health Education. Quein University of Medical Sciences, Quein, Iran..
[3] Professor, Health Promotion Research Center, Zahedan University of Medical Sciences, Zahedan, Iran.
[4]Assistant Professor, Health Promotion Research Center, Zahedan University of Medical Sciences, Zahedan, Iran.
[5] Assistant Professor, PhD in Teaching English, Zahedan University of Medical Sciences, Zahedan, Iran.
[6] Master of Sciences in Health Education. Zabol University of Medical Sciences, Zabol, Iran.

.* Corresponding author email: a.s_dehghani@yahoo.com
Received: 2022/4; Revised: 2022/5; Accepted: 2022/6

Abstract

Sedentary lifestyle in postmenopausal women decreases the health and quality of life. This study aimed to determine the effect of theoretical education on leisure-time physical activity in postmenopausal women.

In a quasi-experimental study, 200 women referring to health centers through a multi-stage sampling method and inclusion criteria were allocated to control and experimental groups. The data collecting tools were a standardized researcher-made questionnaire containing demographic and specific questions relating to the trans-theoretical model and the International Physical Activity Questionnaire.

After the need assessment, the educational program including content, media, and educational method was designed. The subjects in the experimental group participated in three training and three group walking sessions. The educational program continued for four months. After three months, the data in both groups were recollected and analyzed, using descriptive statistics (Mean, Percentage) and analytic tests (Independent sample t-test, Spearman correlation coefficient test, and linear regression test). P-value was set at ≤ 0.05.

After the intervention, the percentage of people in the Pre-contemplation in the intervention group decreased significantly (80% to 17%). On the other hand, in the control group, there was not any meaningful decrease (89% to 79%). Also, the mean score of the leisure time in the intervention group, in comparison with the control group, increase significantly from 226.8 ± 579.9 to 903.6 ± 99.5, ($P<0.05$).

The results showed that the Trans-Theoretical Model is a suitable framework for promoting physical activities in postmenopausal women.

Key words: Postmenopausal women, Physical Activity, Intervention.

Introduction

The menopause stage in the women's life happens due to the loss of ovarian follicles and is defined as a biological stage that is confirmed after the absence of menstrual cycles for twelve consecutive months. The average age of menopause is 48 to 51 years (1-3). In Iranian women, the average age of menopause is 48.2 years, ranging from 48.5 to 48.49 years. In the 17th century, only 28% but, nowadays, in some societies, about 95% of women enter to menopausal stage(2-4).

Many physiologic and pathologic symptoms such as coronary and cardiovascular diseases, diabetes, and osteoporosis, are attributed to the menopausal stage(5-6). Regular physical activity (PA) prevents several types of chronic diseases, enhances mental wellbeing, reduces the rate and symptoms of depression, increases life satisfaction along with the quality of life, and decreases the risk of breast cancer and its mortalities(7-10).

However, the Sedentary lifestyle is common worldwide and studies have shown that at least 60% of people do have not enough physical activities. Likewise, 76.3% of women aged 15-64 are inactive (11-12). A sedentary lifestyle has

[Downloaded from jrhms.thums.ac.ir on 2024-10-12]

long been recognized as a significant factor in mortality and morbidity, but physical activities prevent osteoporosis, and cancer, especially in the menopausal period(7).

In general, physical activity, as individual behavior, has long been recognized as a factor having a significant impact on mortality and morbidity. Similarly, the previous studies have shown that physical activities have not only many benefits for younger women in limitation and prevention of osteoporosis, but also, it is useful in the later years of life, especially in the menopausal period13. Hence, to design and accomplish the educational intervention, it is vital to promote the rate of physical activities in the community, especially, for menopause women.

Considering the complexity of human behavior, Psychologists have offered that every behavior change must be accomplished based on the theoretical framework. The Trans-theoretical model (TTM) for behavior change that is also known as "TTM, provides some strategies and processes for behavior change. TTM consists of four constructs such as stages of change, processes of change, self-efficacy, and decisional balance (13-15).

Stages of change: TTM has proposed that behavior change continues through a series of stages": Pre-contemplation (not ready), contemplation (getting ready): People are starting to look at the pros and cons of their problematic actions. Preparation (ready"): "individuals are intending to take action in the immediate future. Action: People have made specific obvious changes in their problematic behaviors. Maintenance: "Individuals have been able to tolerate action for at least six months". Termination: "Individuals haven't a temptation to return to their old unhealthy behaviors (16-19). Similarly, People may return to an earlier stage from action or maintenance (relapse).

Processes of change: Different strategies and processes contain behavior change processes and cognitive processes that people experience to move toward these stages (19-21).

Decisional balance: The comparative potential of gains and losses of a recommended behavior (22-23).

Self-efficacy: Self-efficacy is a belief that we can succeed, especially our ability to overcome the challenges ahead of us and complete a task successfully (24).

Aim of the Study: Given the importance of PA in health promotion, especially in menopausal women, who constitute a large part of the population, the greater risk of morbidity together with the associated mortality rate were observed as critical health issues. To deal with such pressing issues, the researchers designed and implemented a structured educational intervention to evaluate the effect of educational intervention based on a trans-theoretical model on PA among postmenopausal women in Quein city in Iran in 2018.

Materials and Methods

Setting and participants

In this study, 200 women referring to community health care centers, after passing through a randomized multi-stage sampling method, were allocated to experimental and control groups. The study was conducted in South Khorasan Province, Iran.

Based on the geographic map, the city was divided into four districts: north, south, east, and west. Then randomly two health centers in each district of the city were selected and divided into experimental and control groups. Namely, eight centers were selected for experimental and control groups. Then, based on the population of each center and inclusion criteria, subjects entered the study.

Inclusion and exclusion criteria

Participants who were satisfied to take part in the study were selected. The subjects were the inhabitant of the region, healthy, and without cardiovascular diseases, which may be exacerbated by PA, were the inclusion criteria. Disagreement for continuing in the study and absence in 50% of the educational program were the exclusion criteria.

Data collection tool

Two questionnaires were used to collect the data. The first questionnaire was an approved researcher-made one containing demographic characteristics and queries regarding the TTM constructs. The secondary questionnaire was the

[Downloaded from jrhms.thums.ac.ir on 2024-10-12]

International Physical Activity Questionnaire (IPAQ) which measures the PA in the form of MET- min/week. The content validity and reliability of both questionnaires were identified in several previous studies (11-12).

Educational intervention

Procedure: After the Ethics Committee's approval and coordination of the study, the eight selected health centers, using a simple random sampling method, were allocated to the control and experimental groups. The participants who were in the pre-contemplation and contemplation stages were selected. Then, the study goals were explained. Next, all of the participants signed written informed consent, and the research questionnaires were distributed. Finally, the baseline data in both groups including PA and constructs of the TTM were collected.

The educational program, containing content, media, methods, and learning sessions based on the need assessment, was designed. Three training sessions along with a movie presentation in the experimental group were implemented. Participants in the experimental group took part in three groups walking at the city sports stadium. The educational program continued for four months. Three months later, the data in both groups were recollected and analyzed.

Stages of change: To move from pre-contemplation to contemplation and contemplation to preparation, the strategies of consciousness-raising (increasing awareness via information, education), dramatic relief, paying attention to feelings, and environmental reevaluation (notice your effect on others) was used.

Decisional balance: Decisional balance measures the pros and the cons relating to a recommended behavior. In this study, the benefits of PA such as prevention of obesity, hypertension, depression, stroke, diabetes, and osteoporosis were explained.

Self-Efficacy: Verbal persuasion, direct experiences, and indirect experiences were used for promoting self-efficacy.

Statistical Analysis: An independent t-test was used to compare the mean scores of constructs in control and experimental groups both before and after the intervention. The differences among socio-demographic variables were surveyed by the Chi-squared test. The existence of the significant correlation among the mean score of constructs of TTM with behavior was examined by Pearson's correlation coefficient test. The linear regression test was used to determine the strength of productivity of the TTM constructs on the behavior.

Results and Discussion

In this educational intervention, 200 postmenopausal women participated. The mean ages of the participants in the experimental and control groups were 52.14 and 51%, respectively. The age group of 54-51 years old in the experimental (57%) and control groups (53%) was the largest age group. 93% and 87.9% of the subjects in the experimental and control groups lived with their spouses, respectively. 52% of the participants had 4 to 6 family members. 46% and 48% of the participants in the experimental and control groups had primary and guidance school education levels. Likewise, the findings showed that between two groups in terms of age, living with a spouse, family members, education, and occupation of women no mean differences were observed (Table 1).

Before the intervention, 79% and 80% of participants in the control and the experimental groups were in the pre-contemplation stage respectively, but after the educational intervention the rate of the pre-contemplation in the experimental group meaningfully decreased to 49%, and no significant change was seen in the control group (Table 2). Before educational intervention between the two groups among self-efficacy, decisional balance, process of cognitive change, the process of behavior change, and leisure-time physical activity (MET- min/week) no mean differences were seen, but according to Table 3, after the intervention, due to educational intervention, the mean scores of the experimental group meaningfully increased and the mean differences were seen ($p \leq O.O5$). The findings in Table 4 showed that after the intervention, the behavior had a significant correlation with decisional balance ($p \leq O.O5$).

[Downloaded from jrhms.thums.ac.ir on 2024-10-12]

Table 1. Distribution of socio-demographic characteristics (n = 200).

		Groups			
		Characteristics	**Research Groups**		**P-Value Chi-Square Test**
			Experimental N (%)	**Control N (%)**	
Variable	**Age**	<50	20 (20)	27 (27)	0.497
		51-54	57 (57)	53(53)	
		≥55	23(23)	20 (20)	
	Living With Spouse	No	7(7)	12(12.1)	0.162
		Yes	93(93)	87(87.9)	
	Family Member	≤3	39 (39)	37 (37)	
		4-6	50 (52)	50 (52)	
		≥7	9 (9)	11 (11)	
	Education	Illiteracy	10 (10)	12(12)	0.99
		Primary and guidance school	46 (46)	48(48)	
		Diploma	32(32)	30 (30)	
		Post educated	12 (12)	12 (12)	
	Occupation	House wife	88 (88)	86 (86)	
		Employee	12 (12)	14 (14)	

***Chi-Square Test ***
There were no statistically significant differences between the two groups in demographic characteristics (p< 0.05).

Table 2. Stages of change before and after the intervention (n= 100).

	Stage of Change	**Control**	**Intervention**	**P-Value Exact Chi-Squared**
Before	Pre-contemplation N (%)	79 (79)	80 (80)	P=0.983
	Contemplation N (%)	18 (18)	17(17)	
	Preparation N (%)	3(3)	3 (3)	
	Action	-------	---------	
After	Pre-contemplation N (%)	80 (80)	49 (49)	P=0.001
	Contemplation N (%)	17 (17)	37 (37)	
	Preparation N (%)	3 (3)	12 (12)	
	Action N (%)	-------	2 (2)	

$\chi 2$ = Chi-squared test, *statistically significant difference at P ≤ 0.05.

Table 3. The mean scores of the TTM constructs before and after the intervention

Constructs	***Groups***	***Before Intervention***		***After Intervention***		
		Mean ± SD	**P Value**	**Mean ± SD**	**Mean deference (SD)**	**P Value**
Self-Efficacy	Intervention	14.43 ± 3.1	0.001	15.94 ± 3.65	1.16 ± 1.42	0.001
	Control	15.23 ± 1.8		14.76 ± 2.63	-0.47 2.38	
Decisional balance	Intervention	92.28 ± 8.39	0.94	97.59 ± 4.65	5.31± 8.00	0.001
	Control	92.34 ± 4.02		92.33 ± 4.11	-0.01 ± 5.16	
The process of cognitive change	Intervention	37.22 ± 5.16	0.73	40.2 ± 3.4	2.83 ± 3.89	0.001
	Control	37.4 (± 2.9		37.61 ± 2.7	0.24± 3.01	
process of behavior change	Intervention	30.26 ± 6.1	.45	32.04 ± 2.7	1.78 ± 5.8	0.05
	Control	31.4 ± 2.8		31.82 ± 2.7	0.39 ± 4	
physical activity MET- min/week	Intervention	226.8 ± 579.9	0.9	903.6 ± 99.5	676.7829.8	0.001
	Control	236.7 ± 576.7		285.3± 522.5	48.5 ± 570.09	

[Downloaded from jrhms.thums.ac.ir on 2024-10-12]

Table 4. Matrix correlation among the Trans-Theoretical Model components in postmenopausal women.

	Behavior	Decisional balance	process of change	process of cognitive change
Behavior		.208**	0.88	.175
Decisional balance	.208**		0.395**	0.139
process of change	0.88	0.395**		0.165*
process of cognitive change	.175	0.139	0.165*	

**** Correlation is significant at the 0.01 level (2-tailed)**
*** Correlation is significant at the 0.05 level (2-tailed)**

Considering the insufficient PA in postmenopausal females and its role in decreasing the health quality of life and increasing chronic disease, it is necessary that health policy makers design and implement some efforts to promote PA in postmenopausal women.

The purpose of PA in the postmenopausal period is to maintain a valued level of physical and mental health. The most important benefit of behavioral change models and theories is to attain a deep understanding of health behaviors and the context in which they happen (25-26).

The current study examined the effect of an intervention program based on the TTM on promoting physical activities among employees. The results showed that the educational intervention to promote PA activities was successful. The findings of this study are compatible with those of the previous ones which have confirmed these results (25-27).

According to the TTM hypothesis, the main purpose of the intervention in the community is to move forward in stages of change. The pre-intervention data showed that 80 and 79 percent of postmenopausal women in experimental and control groups were in pre-contemplation stages, respectively. It means these women did not tend to perform physical activity in the future and they were unaware of the negative outcomes of sedentary behavior such as cardiovascular diseases, osteoporosis, and other chronic diseases (25).

After the intervention, only 49% of participants in the experimental group were in the pre-contemplation stage and 30% of them were due to intervention forward to higher stages. It can be calculated that the study succeeded in attaining the most important target of the study. El Sayed et al. found that, after the intervention, the postmenopausal women in the experimental group moved forward in stages of change similar to the results of this study (25).

In addition, before the intervention, only 3% of participants in each group were in the preparation stage, but after the intervention, this rate in the experimental group increased to 13%, and no change was seen in the control group. It was concluded that after the intervention 13% of postmenopausal women in the intervention group were ready to take PA within the 30 next days. In line with this finding, Alinia et al., reported that after the intervention, women were more ready to take physical activities within the next 30 days and started to take small steps toward changing their behaviors. These results were similar to the ones of some studies that were conducted previously(27).

As well as 2% of the experimental group changed their behaviors within the last 6 months and intended to maintain PA. This finding was similar to that of some studies conducted to promote physical activities as the main risk factor for cardiovascular disease (24- 28).

The finding of the study showed that after the intervention the mean score of self-efficacy and decisional balance in the experimental group increased meaningfully in comparison with the control group. Likewise, Bandura and Adams have stated that self-efficacy and more decisional balance were the most vital prerequisite for behavior change. It means that the participants in the experimental group with a higher self-efficacy and decisional balance had a higher capability to accept the PA as reported in previous similar studies (26 29). They stated that

[Downloaded from jrhms.thums.ac.ir on 2024-10-12]

in TT, M-based educational programs the mean score of the self-efficacy and decisional balance after the intervention increase. Hence, they approve of the finding of the present study.

Based on the baseline data the majority of participants were in the pre-contemplation and contemplation stages. To improve the stages of the change, the cognitive and behavioral processes of change include consciousness-raising, helping relationships, dramatic relief, and environmental reevaluation were used. The results showed that after the educational intervention the mean scores of the cognitive and behavioral processes of changes in the participants in the experimental group increased significantly, compared to the control group. The results of past different studies were also consistent with the finding of the present study(25- 30).

According to the TTM hypothesis, the cognitive and behavioral processes of change are helping individuals to move forward to higher stages of behavior change stages. It can conclude that participants in the experimental group had more readiness to participate in the recommended behaviors(11, 25- 30).

Before the intervention, the rate of Leisure-time physical activity in both groups was very low, and no meaningful difference was seen between the two groups, but after the intervention, the mean scores of the MET-min/week PA in the experimental group, compared to the control group, meaningfully increased and a mean difference between the two groups was seen. It can be calculated that women in the experimental group against the control group are more protected against breast cancer, cardiovascular and coronary heart diseases, musculoskeletal disorders, disabilities, and diabetes. Motlagh et al.,(26) Moosavi et al.,(30) Jalilian et al.,(28) and El Sayed et al(25). They have all stated that TTM-based educational intervention had increased the mean scores of the behavior in the experimental group, similar to the present study.

The limitation of the study was the self-reported method for completing the questionnaires on physical activity and TTM. We tried to gain confidence about the accuracy of the responses of the participants by providing the details and information about two questionnaires and using effective and simple communication with women. In this study, the selection of the intervention strategies based on the construct of the stages of change was the strength of the study.

Conclusion

Considering the results of the present study, it can be concluded that the TTM-based intervention was effective in enhancing the physical activities of post-menopausal women. Physical activity for post-menopausal women is a problematic and difficult action, because of some chronic diseases that were related to a higher age. Depression, mood disorders, cardiovascular diseases, osteoporosis, diabetes, and arthritis diseases are the most important obstacles to physical activities in post-menopausal women.

Due to chronic diseases and disorders, post-menopausal women are not able to change their sedentary behavior easily. But TTM is a staged model and based on individual status and stages of change provide some cognitive and behavioral strategies that lead to new behavior.

Acknowledgments

The study was extracted from the master's thesis in health education and promotion. This research was approved by the Medical Ethics Committee of Zahedan University of Medical Sciences with the ethical approval number of IR.ZAUMS.REC.1396.177. We would like to thank the participants of the study.

References

1- Dos Santos Mota MP, Moura IC, Marinho RM, Sternick EB, Almeida AM. Evaluation of cardiovascular risk in climacteric women: A cross-sectional study. Journal of mid-life health. 2018; 9(3):123.

2- Capistrano EJ, Dombek K, da Costa AC, Marinheiro LP. Factors associated with the severity of menopausal symptoms in postmenopausal Brazilian women. Reprodução & Climatério. 2015 1; 30(2):70-6.

[Downloaded from jrhms.thums.ac.ir on 2024-10-12]

3- Wang M, Gong WW, Hu RY, Wang H, Guo Y, Bian Z, Lv J, Chen ZM, Li LM, Yu M. Age at natural menopause and associated factors in adult women: Findings from the China Kadoorie Biobank study in Zhejiang rural area. PloS one. 2018; 13(4): e0195658.

4- Sun L, Tan L, Yang F, Luo Y, Li X, Deng HW, et al. Meta-analysis suggests that smoking is associated with an increased risk of early natural menopause. Menopause. 2012; 19: 126±32. https://doi.org/10.1097/gme.0b013e318224f9ac PMID: 21946090

5- Henderson KD, Bernstein L, Henderson B, Kolonel L, Pike MC. Predictors of the timing of natural menopausein the Multiethnic Cohort Study. Am J Epidemiol. 2008; 167: 1287±94. https://doi.org/10.1093/aje/kwn046 PMID: 18359953

6- Schoenaker DA, Jackson CA, Rowlands JV, Mishra GD. Socioeconomic position, lifestyle factors and age at natural menopause: a systematic review and meta-analyses of studies across six continents. Int J Epidemiol. 2014; 43: 1542±62. https://doi.org/10.1093/ije/dyu094 PMID: 24771324.

7- Carey L. Physical activity was associated with a reduced risk of death from all causes among postmenopausal women. Evidence-Based Nursing. 1998 1; 1(1)

8- Alinia1A, Vahedian2 M, Alizadeh3 P, Attarzadeh, R, Ismailia H, Asgari MG. A Study on Effect of Trance Theoretical Model-based Educational Intervention on Degree of Exercising by Female Adolescent, Tonekabon Township, 2011.

9- Azarbal F, Stefanick ML, Salmoirago-Blotcher E, Manson JE, Albert CM, LaMonte MJ, Larson JC, Li W, Martin LW, Nassir R, Garcia L. Obesity, physical activity, and their interaction in incident atrial fibrillation in postmenopausal women. Journal of the American Heart Association. 2014 20;3(4):e001127

10- Irwin ML, McTiernan A, Manson JE, Thomson CA, Sternfeld B, Stefanick ML, Wactawski-Wende J, Craft L, Lane D, Martin LW, Chlebowski R. Physical activity and survival in postmenopausal women with breast cancer: results from the women's health initiative. Cancer prevention research. 2011 1;4(4):522-9

11- Khosronia L, Jafari F, Hajimiri K. Effect of Education Based on Trans-Theoretical Model on Physical Activity of Reproductive Aged Women Referred to Health Centers in Zanjan. Journal of Human Environment and Health Promotion. 2020 10;6(3):115-20

12- . Physical Inactivity: A Global Public Health Problem. Available at: http://www.who.int/ dietphysicalactivity/factsheet_inactivity/en.

13- Keykhaie Z, Zareban I, Shahrakipoor M, Hormozi M, Sharifi-Rad J, Masoudi G, Rahimi F. Implementation of internet training on posture reform of computer users in iran. Acta Informatica Medica. 2014; 22(6):379.

14- Mazloomymahmoodabad S, Masoudy G, Fallahzadeh H, Jalili Z. Education based on precede-proceed on quality of life in elderly. Global journal of health science. 2014; 6(6):178.

15- Elkazeh E, Elsaay OE. Applying the transtheoretical model of change and the health belief model to breast self-examination in females' undergraduate students in Faculty of Nursing Tanta University. J Am Sci. 2012; 8:804-14.

16- Malekshahi F, Hidarnia A, Niknami S, Aminshokravi F. The Determination of Predictive Construct of Physical Behavior Change on Osteoporosis Prevention Women Aged 30-50: A Trans-Theoretical Method Study. Global journal of health science. 2016; 8(3):183.

[Downloaded from jrhms.thums.ac.ir on 2024-10-12]

17- Abdi J, Eftekhar H, Mahmoodi M, Shojayzadeh D, Sadeghi R. Physical activity status and position of governmental employees in changing stage based on the trans-theoretical model in Hamadan, Iran. Global journal of health science. 2015; 7(5):23.
18- Abdi J, Eftekhar H, Mahmoodi M, Shojaeizade D, Sadeghi R. Lifestyle of the employees working in Hamadan public sectors: application of the trans-theoretical model. Iranian Red Crescent Medical Journal. 2015; 17(2).
19- Taghipour A, Shahroudi MV, Tabesh H, Safari-Moradabadi A, Anbarani MA. The effect of educational intervention based on the theory of planned behavior and stages of change construct on women's physical activity. Journal of Education and Health Promotion. 2019; 8.
20- Prochaska JO, Redding CA, Evers KE. The transtheoretical model and stages of change. Health behavior: Theory, research, and practice. 2015 1:125-48.
21- Friman M, Huck J, Olsson LE. Transtheoretical model of change during travel behavior interventions: An integrative review. International journal of environmental research and public health. 2017; 14(6):581.
22- Elezim A, Elezi G, Gontarev S, Gergiev G. Application of the Transtheoretical Model (TTM) to exercise behavior among Macedonian college students. J Res Health Sci. 2007 28; 7(2):25-30.
23- Tung WC, Farmer S, Ding K, Tung WK, Hsu CH. Stages of condom use and decisional balance among college students. International nursing review. 2009; 56(3):346-53.
24- Jeihooni AK, Karimi S, Kashfi SH, Mansourian M, Afzali P. Effectiveness of educational program based on Trans-Theoretical model in prevention of osteoporosis in women. Journal of Advanced Pharmacy Education & Research. 2018; 8(S2).
25- El Sayed HA, Ibrahim HA, Samia Abd Elhakeem H, Sarhan AE. The Effect of a Trans-Theoretical Model Based Intervention on Physical Exercises Behavior among Postpartum Women at Benha City, Egypt. American Journal of Nursing. 2019;7(3):342-53.
26- Motlagh Z, Hidarnia A, Kaveh MH, Kojuri J. Influence of a trans-theoretical model based intervention on physical activity in hypertensive patients: A randomized clinical trial. Asian Journal of Sports Medicine. 2017 1;8(2).
27- Alinia A, Vahedian M, Alizadeh P, Attarzadeh R, Esmaeili H, Asgari MH. A Study on Effect of Trance Theoretical Model-based Educational Intervention on Degree of Exercising by Female Adolescent, Tonekabon Township, 2011.
28-Huang, C.M., Wu, H.L., Huang, S.H., Chien, L.Y., Guo, J.L. Transtheoretical model-based passive smoking prevention program among pregnant women and mothers of young children. Eur J Public Health. 2013; 23(5):777-782.
29- Jalilian M, Darabi M, Sharifirad Gh, Kakaei H. Interventional Program based on Trans-Theoretical Model to Promote Regular Physical Activity in Office Workers. J Health Syst Res 2013; 9(2): 188-195.
30-Moosavi S, Farmanbar R, Fatemi S, Yazdanipour MA. The Effect of a TTM-Based Intervention on Level of Physical Activity in ICU Nurses. Iran Red Crescent Med J. 2017; 19(12): e59033.16. López-García I, Vicente-Martínez Y, Hernández-Córdoba M. Nonchromatographic speciation of selenium in edible oils using dispersive liquid–liquid microextraction and electrothermal atomic absorption spectrometry. Journal of agricultural and food chemistry. 2013;61(39):9356-61.

[Downloaded from jrhms.thums.ac.ir on 2024-10-12]

17. Davis R, Carlton-Smith C. Crops as indicators of the significance of contamination of soil by heavy metals. Crops as indicators of the significance of contamination of soil by heavy metals. 1980(TR140).
18. Thomas DS, Furuseth OJ. The realities of incorporating sustainable development into local-level planning: A case study of Davidson, North Carolina. Cities. 1997;14(4):219-26.
19. van Lier HN. The role of land use planning in sustainable rural systems. Landscape and Urban Planning. 1998;41(2):83-91.
20. Chary NS, Kamala C, Raj DSS. Assessing risk of heavy metals from consuming food grown on sewage irrigated soils and food chain transfer. Ecotoxicology and environmental safety. 2008;69(3):513-24.
21. Rouniasi N, Parvizi Mosaed H. Investigating the amount of heavy metals in different parts of some consumable vegetables in Karaj City. Iranian Journal of Health and Environment. 2016;9(2):171-84.
22. Akan J, Kolo B, Yikala B, Ogugbuaja V. Determination of some heavy metals in vegetable samples from Biu local government area, Borno State, North Eastern Nigeria. International Journal of Environmental Monitoring and Analysis. 2013;1(2):40-6.

[Downloaded from jrhms.thums.ac.ir on 2024-10-12]